CHAPTER I
GENERAL INTRODUCTION
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Fishes are valuable source of high-grade protein and other organic products. They occupy a significant position in the socio-economic fabric of the South Asian countries by providing the population not only the nutritious food but also income and employment opportunities. Of the 21,723 fish species known to science, over 40% live in the fresh water and majority of them live in tropics between Latitudes 23°5'N and 23°5'S. Nowhere in the world is a zoogeographic region so blessed as the Indian subcontinent (India, Pakistan, Nepal, Burma, Sri Lanka, and Bangladesh) in respect of the diversity of fish wildlife that dwells the inland and coastal waters.

India is endowed with a vast expanse of open waters in the form of rivers, canals, natural and man made lakes, estuaries, backwaters, brackish water impoundment and mangrove wetlands. Potentially, the fish resources of India are the richest in the world. In terms of production too, India ranks second in the world, first being China.
The Indian fish fauna is an assemblage of about 2500 species depicting diverse characteristics, of which 930 species belonging to 326 genera, inhabit the inland waters (P. K. Talwar and A. G. Jhingran, 1991).

The estuarine capture fisheries form an important component of fisheries resources of India. In this continually changing environment, distinctive biological entities composed of animals and plants have evolved which exhibit high degree of adaptation to the physical and chemical constituents characterizing this environment. Thus, a characteristic type of fish population has developed in each estuary on which the commercial fisheries are based. Species that use this region as a nursery ground include both prawns and fishes, those that enter from the sea as well as those that migrate down from the upstream stretches of the river. The fisheries of the estuaries in India are slightly more than the subsistence types and contributes significantly to the total inland fish production. At present the average production rate varies between 45 and 75 kg/ha. The estuarine capture fisheries offer great scope for further development of fish production from open estuarine waters.
A comprehensive and authoritative account of the fishes of the Indian region was published by Francis Day in 1889. During the intervening 100 years nothing substantial has been published to bridge the gap. The recent publication by Jayaram (1984) leave much to be desired. The examination of the century old fish collections, including types, of distinguished ichthyologists like Day, Annandale, Chaudhuri, Prashad, Mukerji, Hora, Misra, Silas, Menon, Jayaram, Husain, Yazdani, Tilak etc. in the repository of the Zoological Survey of India, was an added advantage.

The growing realization of the importance of fish as food and of the role this fact might play in meeting the ever increasing global food problem in the context of the immense potential of resources for exploitation, has been instrumental in the initiation of development of fisheries in many countries where it never existed to any significance as well as an encouraging expansion of fisheries where it already existed. Fisheries primarily started as capture fisheries including commercial fishing in natural resources (seas: marine fisheries, rivers, lakes: fresh water fisheries). Fish culture on commercial scales is recent innovation to fisheries but it has assumed great significant for the great prospects it holds. Therefore, most of the countries one after the other turned to
pisciculture/aquaculture in course of time. Fish culture to is practiced in both fresh water and salt water bodies. With expanding fisheries, the world over, fish production started influencing the national economy of the countries to a large extent. Fisheries sprang up as an important industry in many parts of the world. It also opened immense job potentials as a means of living and income generation. At international level, exports and imports of fish and fish products increased tremendously in recent years. A number of countries export more fish than they import, i.e. Iceland, Canada, Norway, Denmark, Holland, Greenland, Southwest Africa, Peru, Portugal, India, Australia, Japan, Angola, Mexico, Morocco, Iran, and Union of South Africa. Then there are the other countries that import more fish than they export viz., U.S.A., Germany, U.K., France, U.S.S.R., and Spain. The process is influenced by the natural resources, feeding habits, needs and demands for fish, the current status of fishery of the land, the technology of utilization and preservation of fish as commodity.

Fisheries and agriculture have almost parallel evolution in the history of human civilization. Interest in fish eating dates back to the dawn of the history. It was being believed that hunting for fish was not uncommon in prehistoric times. At the dwelling sites
near a river or lake of cave dwellers of the late Old Stone Age (40,000 B. C.) heaps of refuse of shellfish and sea fish have been found. New Stone Age (10,000 B. C.) has also given the evidence of salmon smoking practices. Bronze Age (3,500 B. C.) was the time when the salting of fish started. Iron Age (1000 B. C.) saw the great trades in dried, smoked and salted fish in Greece. The time 400 B. C. to 450 A. D. was the period of emergence of highly organized fisheries in the Roman Empire. In the Middle Ages (500 A. D. to 1500 A. D.) fishing activity was more pronounced in the Atlantic and herring and similar other fisheries gained importance. It was not until the beginning of the 18th century that preservation in ice was started. The Chinese were the first to use ice in preserving the fish during transport. The interest in the nutritive value of fish was first keenly taken when a sudden meat scarcity occurred during the post World war I period. In twenties and thirties the discovery of vitamins A and D placed fish in esteemed position because of the revelation that fish are generally rich in them.

Fish culture involves the production of fish in a given water body far above the level that is naturally obtained. This is made possible by not only controlling the feeding growth and breeding of fish but also controlling the characteristics of water mass. This
increases the fish production. The success of fish culture lies mainly in the profit earned from the production. The aim of fish culture is mainly to increase the production of fish for human food.

Fish culture seems to be of great antiquity. Evidence is on record that fish was cultivated about 2,500 B.C. in Egypt, 2,000 B.C. in China and 300 B.C. in India. Today, the importance of fish culture is being realized as never before, in the face of mounting pressure of population explosion. Countries most obsessed with food scarcity viz., China, Vietnam, Cambodia, Indonesia, India and Pakistan are vigorously practicing fish culture at present.

An essential pre-requisite of fish culture is availability of fish seed. Fish seed is a commercial term used, to denote all stages in the life cycle of a desirable fish species i.e., from egg to young ones that are traded for stocking fish-culture ponds. Seed fish, on the other hand, is a term used for sexually ripe adults who are stocked for spawning purposes. Fish seeds comprise, spawn (fertilized developing eggs), hatchlings (just hatched stages), prolarvae or sac fry (larvae with yolk sac), fry (larvae with yolk absorbed), juveniles (young ones looking like adults), fingerlings (young ones of large
fishes when measuring only 4 to 12 cm in length), young of year (age group is zero), yearling (age group is 1+), two year old (age group 2+), etc. Quality, quantity and time of availability of fish seed are great limiting factors in the success of fish culture. With expanding trade in fish and fish products, the demand for fish culture has increased. Transport of fish seed to far off places is another problem generally experienced.

The Karwar bay is highly productive from the fisheries point of view (Ramamurthy, 1968) and the Kali estuary with its backwaters with their shallow and deeper portions constitute an ideal breeding and nursery ground for various finfishes and shell fishes (Bopaiah and Neelakantan, 1982). The larval distribution of estuarine organism is closely related with the estuarine circulation, based on tidal effect and fresh water influx and other mixing process; and biotic factors such as fecundity and the larval mode of life. Despite the investigation mentioned above there has been no attempt in the past to study the seed resources of this estuary. In this regard the present investigation was undertaken to study the fish seed resources of Kali estuary.
The sources for obtaining fish seed are, the spawn from a natural breeding of fish, and the other is the spawn from an artificial breeding of fish. The former includes the supply from rivers, streams and bundhs. The latter includes the stripping method and pituitary hormone induced breeding.

Though the Karnataka coast has about 5000 hectares of estuarine area, very little information is available on the occurrence of fish seed and its composition on space and time. A good amount of work has been carried out in the past millennium on the fin fish and shellfish fisheries of river Kali. But there is no specific study on the abundance, distribution and diversity of fish seed of Kali estuary. But compared to fish seed more work has been done on prawn seed.

In context of a deep-felt necessity to get information on the fish seed resources of Kali estuary, one of the major estuarine systems of Karnataka, the present study was undertaken. Hence, to fulfill this lacunae in information, a detailed study was undertaken in the present investigation on different species of fin fishes, their seasonal distribution, abundance, etc. in relation to
various hydrological parameters at different study stations located along back waters of Kali estuary.

The results are compared and discussed with the earlier findings and observations are presented in tables, graphs and photographs etc.

The thesis comprise following chapters, viz,

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Chapter- III. ENVIRONMENTAL ECOLOGY
Chapter- IV. SYSTEMATICS
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Chapter- VI. DISCUSSION AND CONCLUSION

SUMMARY
REFERENCES